

A Comparison of the First
Book of Vergil's Georgics with
the Eighteenth Book of Pliny's
Natural History

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of Virgil's Georgics
with eighteenth book of
Pliny's Natural history.

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1.
A comparison of the First Book of Vergil's
Georgics with the Eighteenth Book of
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In studying a work so full of poetic beauty, so finished and artistic in form and construction as Vergil's Georgics we cannot help wondering, a little skeptically, if the poet has not sacrificed the element of instruction to that of adornment. Two means of verification are open to us; we may compare Vergil's treatise with the agricultural precepts given by the great authorities on agriculture who preceded him, especially Cato and Varro or we may examine the works of the writers who followed him and discover to what extent they corroborate his teachings and their attitude toward him as an authority on agriculture.

Of these writers who followed Vergil, perhaps the most interesting is Pliny the Elder. Though he certainly had no practical knowledge of farming, his great interest in all kinds of knowledge and his familiarity with books make it probable that he was acquainted with the best agricultural practice of his time, as set forth in

Author.

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the works of the great writers on agriculture. He was born at Novum Comum, in A.D. 23 and died in 79, just one year after the publication of his greatest work, his Natural History. This encyclopediac work embraces, as the author himself informs us, over twenty thousand matters of importance, drawn from one hundred selected authors. It is not merely a natural history in the sense in which we use the term to-day, but embraces astronomy, physics, geography, agriculture, commerce, medicine and the arts as well. Several books are devoted to the natural history of plants and trees but only two, the seventeenth and eighteenth have anything to do with their cultivation. The eighteenth covers in general, the same ground as the first book of Vergil's Georgics; the seventeenth is devoted to the cultivation of trees and vines as is the second book of the Georgics. It is with the relation between the first book of Vergil's work and the eighteenth book of Pliny's Natural History that this paper is especially concerned, though in some cases it will be necessary in order to get Pliny's entire treatment of a subject, to consult other books of

the Natural History, particularly the seventeenth.

Nearly all of the subjects treated in Vergil's first Georgic are taken up by Pliny in more or less detail and a study of the two writers reveals a great many similarities in subject matter, though the plan of the two works, the order and arrangements of precepts is, necessarily, from the diverse objects of the two writers wholly different.

The beautiful invocation to the Gods and Goddesses which open Vergil's poem can of course find no parallel in the work of the prose writer. Pliny does not indeed call upon the Gods, at all, for assistance. He states the subject of his work however very much as Vergil does, promising a treatment of the various methods of cultivating the land, also of the various constellations and of the indications which they afford to the earth.

Immediately after the exordium Vergil proceeds to a discussion of the proper times and methods of ploughing. Pliny precedes his discussion of this subject by a brief discourse on farming in general, directions about buying land, the proper arrangements for a farm-house, a few isolated precepts of the ancients,

an account of the various kinds of grain, the diseases of grain and their remedies, and the crops that should be sown in the different soils.

In their discussion of the proper treatment of corn land preparatory to sowing both writers recommend nearly the same operations and give nearly the same directions in regard to them. Pliny usually gives more detailed instructions but very rarely contradicts those of Vergil. Both discuss ploughing fallowing and burning the stubble.

The advice given by Vergil in regard to the subject of ploughing though the real meaning of the passage has been much disputed seems to be, in substance: "Begin to plough very early in the spring; for the best results are obtained when the field is ploughed four times. But before you begin to plough, determine the nature and capacities of your soil; for different soils are adapted to different products, just as different countries produce different things. This is the law of nature. Come, then as I have said, begin to plough rich land in the very first months of the year, in order that the soil may be exposed to the summer heat. Poor land need

not be ploughed till September. Rich land should be ploughed early in order that weeds may not choke the crop; poor land late that it may not lose the little moisture that it has.

In regard to the proper time for beginning ploughing, Pliny endorses Vergil's advice that rich land should be ploughed in the early spring but advises a still earlier ploughing in the preceding autumn or winter for very rich heavy land. Treating of the work to be done between the prevalence of the west winds and the vernal equinox, he says, Bk XVIII, Chap. 65: "terra in futurum proscinditur, Vergilio maxime auctore ut glebas sol coquat, utilior sententia quae non nisi temperatum solum medio vere arari jubet quoniam in frigida statione sulcos occupent herbae, graculi insecti aestus exsiccent omnemque succum venturis seminibus auferant, talis autem tempore melius arari certum est."

He gives in this passage exactly the same reasons for the early ploughing of rich land and the late ploughing of thin land that Vergil does. Again in XVIII, 49, he gives the same recommendations in a discussion of the proper times of ploughing different soils

"Altum et grave solum etiam hieme moveri placet, tenue, valde et aridum, paulo ante sationem" Pliny also gives much more extended instructions in regard to the proper times for ploughing different soils in accordance with their density, fertility and the climate of the locality.

In regard to the number of ploughings required by a grain field, Pliny XVIII, 49 seems to prescribe only two ploughings or three if the seed is ploughed in, instead of being harrowed in. He interprets Vergil's disputed passage, lines 47. and 48. as meaning four ploughings, however and heartily approves of the extra treatment adding that in some parts of Italy they plough as many as five times before sowing and in Etruria they give the land nine ploughings.

The four ploughings to which both Vergil and Pliny refer must have been done in spring, summer, early autumn and October, since there is no authority whatever for the theory held by all the modern commentators that rich land often received an extra ploughing in the autumn of the year before the seed was sown. No hint is given of the existence of such a custom, by

any of the Roman writers on agriculture.

The winter or autumn ploughing which Pliny recommends for very rich, heavy land is not an additional ploughing but is intended to take the place of the usual spring ploughing.

The only ancient writer on agriculture who makes any mention of this extra autumn ploughing, is the Greek Theophrastus. On the other hand, Varro, Columella and even Vergil in the very passage in question distinctly say that ploughing should begin in the spring.

Both authors briefly but strongly recommend cross-ploughing. Vergil I 47.8 says: *et qui proscisso quae suscitât aequore terga rursus in oblicum verso pervenit aratro*.

Pliny XVIII, 49: "omne aruum rectis sulcis, mox et obliquis subigi debet"

Everything that Vergil says on the subject of ploughing is fully corroborated by Pliny. The latter however, adds several particulars that Vergil has not touched upon - especially directions in regard to the mode of ploughing - the proper method of harnessing the oxen, muzzling them if necessary, the advisability of attaching a bill-hook to the plough for the purpose of cutting up roots, levelling of the ridges, making

drainage channels, the method of ploughing hills and a caution against ploughing wet ground.

In the midst of his discussion about the times and frequency of ploughing, Vergil pauses to warn the farmer to consider carefully the nature and capacities of the soil, what it has produced and to what crops it is best adapted. For one soil, he says is suitable for corn crops, another for grapes, another for trees and grass. In the same way different countries have different products, Tmolus producing fragrant saffron, India ivory, Arabia, frankincense, the land of the Chalybes, iron, Pontus, castor, Epirus, maris which win the palm at Elis. This has been the law of nature ever since the creation of man.

Pliny introduces the subject of ploughing with an account of the various systems of cultivation employed by different nations, comparing the ease with which the fields of Egypt, Babylon and Syria are cultivated with the difficulty of tilling some parts of Italy "where" he says "it takes as many as eight oxen to part and blow at a single plough". In conclusion he

asserts with emphasis: "Remember that every locality has its own tendencies".

In the second book of the *Georgics*, lines 176-225, Vergil discusses the question of what soils are best for different products, His treatment of the subject is not very full, including a discussion only of the best soils for the olive, vines, cattle and corn. His statements are, in brief: A hard, barren hilly soil with marl and gravel is best for the olive. The presence of the wild olive on land is evidence that the soil is good for the cultivated olive. A rich, moist soil where fern growe easily, such a soil as is often seen in valleys, and having a southern slope is best for vines.

Cattle thrive best on such land as that of Tarentum or Mantua.

A rich black crumbling soil or one that has been lately cleared is best for corn.

Thin gravelly soils can barely furnish such herbs as casia and rosemary.

Tufa and marl are infested by serpents. Land which readily takes up and gives off moisture, and is covered with grass is good for everything, for grain, vines, cattle.

Pliny does not recommend any one soil for the olive in general but recommends different soils for different varieties. Certain varieties, he says quoting Cato De Re Rust. 6, the greater radius, the Salentina, the orchites, the posia, the Sergian, the Cornunian and the albicera, thrive best in a warm rich soil. The Licinian olive he says should be planted in a cold and meagre soil - as a rich or hot soil has the effect in this variety of spoiling the oil, while the tree becomes exhausted by its own fertility and is liable to be attacked by a kind of red moss. He cautions the farmer to plant always those varieties which thrive best in the neighboring localities. He also emphasizes the fact that the soil required by the olive is different in different regions. In Venafum which he says, holds the highest rank in the production of olives, a gravelly soil is best for the olive; in Baetica which stands next to Venafum in the culture of olives, a soil of great richness is considered best.

The two authors do not disagree in this matter. Pliny has merely treated the subject more exhaustively than Vergil, taking into account the different varieties of the olive and

differences of locality and climate and showing the importance of these things in determining the character of the soil to be chosen.

In regard to the soil best adapted to the vine Pliny says that the black earth which prevails in Campania is not everywhere found to be suited to the vine nor that which gives off light vapors nor the red soil so much commended by many. The cretaceous earth found in the district of Alba Pompeia and an argillaceous soil are he says, the best for vines though they are very rich - a quality not usually considered beneficial to the vine. But that a rich soil is not always harmful to vines he himself asserts in XVII, 3. where he says that the vines of Pucinum are ripened upon a rock and the vines of Caecubum are moistened by the waters of the Pomptine marshes.

In the fourth chapter of the fourteenth book, he mentions several varieties of the vine, often giving the climate and soil best adapted to each.

In regard to the best aspect for vines Pliny agrees with Vergil that it is best for them to look to the south and refers to Vergil's condemnation of a Western

aspect, Georgics II, 398. He emphasizes the fact however, that in deciding the situation of a vineyard, the nature of the soil, the character of the locality and climate and the variety of the vine are important elements and must not be overlooked.

Pliny does not discuss the soil best adapted for pasture land.

In XVIII, 7 quoting Cato, Pliny says that the dwarf-elder, wild plum, bramble, bulb, trefoil, meadow grass, quercus, wild pear and wild apple are all indicative of corn land and that black soil, also or soil having an ashy color signifies the same thing. This agrees in some points with Vergil's statements about corn land. Both recommend black soil, a soil that has produced trees and one that produces grass.

Tufa which Vergil says is infested by snakes, according to Pliny is commended by some authors for agricultural purposes.

In another part of his work, XVII, 46 Pliny gives a very detailed discussion in regard to what soils are best adapted to particular kinds of grain - a topic which Vergil has not touched upon.

There is so little similarity in the two authors in their treatment of this

subject of the capacities of different soils, that it is impossible that Pliny can have made much use of this part of Vergil's work. Indeed, Vergil's account is so brief in view of the possibilities of the subject that it was necessary for Pliny to draw most of his material from another source.

Next after ploughing, Vergil takes up the subject of fallowing and rotation of crops. This passage has been much discussed and the exact meaning of some parts of it is not at all clear. In general, however, his advice is: You should also let your fields rest by permitting them to lie fallow every other season or you should practice rotation of crops, alternating spelt with beans, vetches, or lupine, not with flax oats or poppies, for they exhaust the ground. But even these can be easily raised if you fallow occasionally and manure abundantly. So, also, by the use of manure, the land rests when the crops are changed and meanwhile, there is no ingratitude from the unploughed land.

Pliny XVIII, 30 refers to Vergil's recommendation that land should be fallowed every other year and says that this is no doubt, the best plan, if the

extent of the farm will admit of it. If this is impossible he recommends that spelt be sown upon the ground that has been cropped with beans, lupine or vetch, since these act as fertilizers. He also XVIII, 52, suggests alternating barley with millet and rape, a rotation which Vergil does not mention. Rich land, he says, may be fallowed one year, care being taken to alternate corn with leguminous crops, while land that is thin may lie fallow up to the third year, even.

In XVII, 7 speaking of beneficial and harmful plants, he says that corn land is manured by the lupine, the bean and the vetch, while the chick-pea, barley, fennugreek and fitch indeed all plants which are pulled up ^{by} the roots have a tendency to exhaust the land. He refers to Vergil's discussion of the subject with the remark "Vergilius it lino segetem exuvie et avena et papavere arbitratur". In another part of his work XIX, 1 he corroborates Vergil's statement about the injurious character of flax with the assertion "vit agrum deteriorumque etiam terram facit." But although he discusses oats and poppies at some length, he says nothing about their scorching nature and seems indeed, to agree with Cato's recommendation

to sow the poppy on corn land which he quotes in XVIII, 61.

In the main points of the discussion however, he entirely agrees with Vergil, emphasizing everything that Vergil recommends - and adding very little of importance.

Vergil recommends the abundant use of fertilizers when an exhausting crop is to be sown or when rotation of crops is practiced. Pliny treats this subject at length, giving the kind and amount of fertilizer required and the proper method and time of using it. He emphasizes very strongly the necessity of fertilizing, declaring that this is the only point universally agreed upon - that we must never sow without manuring. He recommends the sowing of wheat rather than barley, if the land has not been manured, millet, panic, and rape should, he says never be sown in any but a fertilized soil, and even when beans are sown, the land should have been manured as recently as possible.

Both writers commend the use of ashes as a fertilizer. Pliny says that the agriculturists beyond the Padus are especially fond of ashes for this purpose even preferring them to dung but not using

both indiscriminately on the same soil. He also says that dust is useful for this purpose.

Vergil's passing mention of the subject of fertilizing has of course had no influence on Pliny's extended discussion.

The next process which Vergil recommends as beneficial to corn land is the burning of the stubble and he gives his reasons for this advice at considerable length. Pliny among other operations which he recommends for the harvest time mentions this process and Vergil's commendation of it and says that its chief merit is that it destroys the weeds and their seed with them. In an entirely different connection, when he is discussing the proper seed time of the poppy he quotes Cato's advice to burn the twigs and branches upon corn land and then sow the poppy there.

The necessity of thorough harrowing of the ground before sowing is mentioned by Vergil in lines 94, 5, 6. Pliny also emphasizes this very strongly and says that a field is badly ploughed that needs to be harrowed after the seed is in, in order to break up the clods.

In regard to the preparation of the land for the seed, the two authors agree perfectly. Pliny gives a great many

details which Vergil could not bring into his poem but none of the precepts given by Vergil are passed over or contradicted by the later writer.

At this point in his discussion of the cultivation of the land, Vergil breaks off a moment to bid the farmers pray for suitable weather in order that their labors may not be fruitless. "Pray for wet summers and dry winters", he says "then your harvests will exceed those of Mysia and Bithynia."

Pliny XVII, 2 says that nothing is more injurious to trees than a warm winter and referring to this passage of Vergil remarks that the poet who said that serene winters are to be desired did not express his wishes with reference to trees.

After this little interruption Vergil goes on to treat of the proper care of the land after the seed has been sown and of the growing crop. The irrigation of dry lands, the process of reducing too abundant crops by pasturing cattle on and the draining of wet lands are taken up in turn.

Vergil does not explicitly state the proper method of covering the seed but seems to imply in 105 that it was done with rakes or harrows. The line has been

taken by some commentators to refer merely to the swelling of the land. The word "cumulosi" would in that case mean "clods of earth" and the sentence would read "What shall I say of him, who, after the seed has been sown immediately falls upon the field and breaks up the clods of the barren sand, then brings on the fresh streams." There are many serious objections to such an interpretation of the passage. In the first place the word "haruna" is regularly used only of dry, sandy land, in which there would be no hard clods. It is true that in line 291 of the fourth book of the Georgics, Vergil uses "haruna" of the rich earth carried down by the Nile. But here the word "haruna" is used purely metaphorically as the river is accustomed to carry sand. Moreover it is evident from the context that the land is dry and needing irrigation. The regular meaning of "male pinguis" also would be unfertile, barren not that which has been given to it by the advocates of this interpretation - "too stiff." "Male" is not infrequently used to intensify an adjective having a bad sense, as "male ranci", "male perivivaci" but "pinguis" regularly has a good sense. With "pinguis" therefore "male" would regularly have the negative force which Vergil himself gives it in the phrase "male sana" equivalent to

"insana"

Moreover, it was considered by the Romans an evidence of bad farming if a field needed harrowing after the seed was sown.

Pliny XVIII 49, says "male aratur arvum quod satis frugibus, occandum est".

Columella II, 4 says: "Nam veteres Romani dixerunt male subactum agrum qui satis frugibus occandus est."

Vergil would hardly commend in such strong terms a farmer who was compelled to do what was condemned by the authorities on agriculture and by Roman tradition.

Though from the number of obvious inconsistencies, this interpretation must be rejected, it is impossible to find one which obviates all difficulties. The most satisfactory interpretation, however is the one which gives to the word "cumulos" the meaning "ridges" making "runt cumulos" refer to the breaking down of the ridges between the furrows, in order to cover up the seed sown in the furrows. Dickson in his work on the husbandry of the ancients shows that the Romans sowed both in the furrows and on the ridges between the furrows. It seems to have depended largely on the nature of the land which method was employed. Columella, treating of the culture of the asparagus XI, 3 says that, in dry land,

seed should be sown in the bottom of the furrow but in wet lands on the highest back of the ridge lest they should be hurt by too much moisture. As this field is a dry one which needs irrigation, Vergil probably intended that the seed should be sown in the furrows. In line 105, then, he refers to the covering over of the seed by the farmer with the rake or harrow.

Pliny mentions two methods of covering the seed - with the harrow or with the plough with a plank attached to it, by the operation called "lirare".

In lines 106-110, Vergil draws a vivid picture of the relief given to the parched crops by irrigation. Pliny says nothing about the irrigation of corn land but recommends both irrigation and drainage for orchards and vineyards. About the rising of the dog-star he considers the best time for irrigation. He gives some instructions in regard to the amount of irrigation necessary but does not discuss methods of irrigating.

Lastly, Vergil recommends draining swampy land with absorbent sand, but gives no instructions as to the proper method. Pliny XVIII, 8 also recommends draining land that is too moist and gives directions about the construction of trenches

for this purpose.

The operations recommended by Vergil in these lines are for the most part so universal and so briefly treated that Pliny can have borrowed but little from this part of the poem and small opportunity is left for contradiction. The process of pasturing cattle on crops that are too luxuriant is the only thing which could under any circumstances be said to have been borrowed by Pliny. Nor is it at all certain that he did not derive even this from another source. Theophrastus H. Pl. VIII, 7 says; 'ἐν δὲ τοῖς ἀγαθοῖς χύραις πρὸς τὸ μὴ φύλλοιναεῖν, ἐπιτέμνουσι καὶ ἐπικείρουσι τὸν σῆτον. It seems probable, however from the frequency with which he refers to Vergil's Georgics that though he may have been acquainted with the statement of the earlier writer he derived the precept directly from Vergil. It seems rather singular that Vergil has nothing to say in regard to the hoeing and weeding of the growing crops. Pliny mentions this frequently and gives specific directions about the hoeing and weeding of many of the different kinds of grain.

Even when you have done all these things, Vergil continues, your

labor is not done. You must still contend with birds, weeds, and harmful shade. For so the father has willed that men might not grow sluggish from inaction. Then follows a digression on the golden age and the discoveries and inventions following the removal of its ease and plenty. So, he says, toil conquered the world, even on the grain, after the introduction of agriculture by Ceres, fell innumerable plagues - mildew and troublesome weeds, the thistle, burr, caltrop, and the darnel. The only means of overcoming these enemies is hard labor.

Pliny ~~XXIII~~ 44, 5 - discusses at length the things harmful to grain and suggests remedies for them. Of these he says that mildew is the greatest curse of all to corn and affirms that if branches of laurel are fixed in the ground the mildew will pass into the leaves of the laurel. Among harmful weeds, he mentions the darnel (*lolium*), caltrop (*tribulum*), the thistle (*carduus*), just as Vergil does. The only one of the plagues mentioned by Vergil which he fails to note is the lappa (.burr) But he adds many which Vergil has omitted -, injurious rains and winds

insects and several weeds, the burdock, the orobanche, the aegilops, the pelecynon, and the iteramon.

After mentioning some of the evils with which the farmer must contend Vergil proceeds, lines 160-169 to enumerate the arms necessary for this warfare - the agricultural implements. These are ploughs, wagons, threshing-sledges, drags, rakes, baskets, hurdles and fars. He then 169-175 gives a brief description of the plough, its various parts and construction.

Pliny nowhere gives a formal list of agricultural implements. He treats at some length of the various kinds of ploughs used on different soils and for different purposes, but gives no full description of any one plough merely mentioning the distinguishing feature of each, usually the character of the share. He makes no reference to this passage of the Georgics lines 160-175 and has evidently made no use of it.

After treating of agricultural implements, Vergil gives several miscellaneous precepts of the ancients, the smoothing of the threshing-floor, the prognostication of the corn-crop by the walnut tree the steeping and selection

of seed-beans. The threshing-floor, he says, should be smoothed with a heavy roller, worked by hand and made solid with chalk lest weeds or dust getting into it make holes where destructive pests may enter. The second precept, the prognostication of the corn crop by the yield of the walnut tree is nowhere alluded to by Pliny. The third precept recommends the practice of steeping seed-beans in nitre and mother-of-oil on the ground that it causes a large crop and one that will boil easily. Vergil also emphasizes the necessity of the careful selection of seeds, each year.

Pliny also gives a list of maxims of the ancients but they are altogether different from the ones given by Vergil. In other connections however he mentions some of those stated by Vergil. When giving the work to be done after the summer solstice XVIII, 71, he says that the threshing-floor should be prepared for the harvest with chalk slackened with amurca of olives, according to the recommendation of Cato. "Vergil" he says makes mention of a still more laborious method but it is usually considered sufficient after making it perfectly level to cover it with a solution of cow dung

and water, this being thought sufficient to prevent the dust from rising. In connection with the discussion of the diseases of grain XVIII, 45, and their remedies, he mentions Vergil's recommendation that seed-beans be steeped in nitre and amurca of olives. He gives some instructions XVIII, 54 about the selection of seeds in accordance with their color and weight and emphasizes the same fact that Vergil does in this passage that new seed should be selected each year. "Semen optimum, arviculum, binum, deterius, trimum, pessimum, ultra sterile".

In the Georgics, the treatment of the subject of the selection and preparation of the seeds for sowing is followed by a discussion of the proper times for sowing. The subject is opened with an exhortation to the farmer to watch the stars carefully. It is as important for the farmer as for the sailor says Vergil to watch the rising and setting of the stars.

Pliny XVIII, 56 refers to this recommendation of Vergil's and heartily supports it but cautions his readers against ignorantly following the stars. Again, in the same chapter, quoting Vergil's state-

ment that wheat and spelt should be sown at the setting of the Vergiliae, barley between the autumnal equinox and the winter solstice and vetches, kidney beans, and lentils at the setting of Boötes. He says that it is very important to learn the exact days of the rising and setting of these and other constellations.

Immediately after this brief introductory exhortation, Vergil proceeds to fix by the rising or setting of the stars the proper seed-time for the different grains. Barley, flax and poppies, he says, should be sown between the autumnal equinox and the winter solstices. Pliny says that barley should be sown about the setting of the Vergiliae. His statements about the seed-time of flax and poppies are contradictory. In XVIII, 56, he speaks as if the spring were their regular seed-time, "quidam omnia caelesti subtilitate temporibus definiunt; vire linum et avenam et papaver atque uti nunc etiam Transpadani servant usque in-quinquagesimas. But in XVIII, 61 he says that flax and the poppy should be sown in the autumn and quotes Cato De Re Rust.

"Virgas et sarmenta quae tibi visioni
supererint in segete comburito, ubi
eos combuseris ibi papaver serito.

According to Vergil, beans
should be sown in the spring. Pliny
XVIII, 30 recommends that beans be sown
just before the setting of the Vergiliae,
since the bean that is sown early can
be used as fodder for cattle. He refers to
Vergil's recommendation that it be
sown in the spring and says that
this is in accordance with the usage
of the parts of Italy near the Padus.

Lucerne and millet
should be sown, says Vergil, - at the
rising of the bull and the setting of
the dog. According to Columella, the
bull rises on the seventeenth of April
and the dog sets on the last day
of the same month. Pliny says
that according to the Boeotians and
Athenians, it is on the twenty-sixth
of April that the bull rises but according
to the Assyrians the twenty-ninth.
Pliny says that lucerne should be
sown in May, since, if sown earlier,
it is in danger from frosts. He
says that millet should be sown
before the rising of the Vergiliae.

Wheat and spelt according

to Vergil should be sown before the setting of the Pleiades. Pliny ~~XXIV~~, 10 gives the same advice.

The setting of Boötes, October 29th is the seed time given by Vergil for the vetch, the kidney bean and the lentil. Pliny gives a more exhaustive treatment of the subject mentioning three different times for sowing the vetch. The first is the one mentioned by Vergil - about the setting of Arcturus, the second is in January and the last in March, the time chosen, depending on the use to be made of the crop. In regard to the sowing of the kidney bean he agrees with Vergil that it should be done between the ides of October and the kalends of November. The lentil, he says, should be sown in November.

In the discussion of the subject of sowing also as elsewhere, Pliny gives some facts which Vergil did not care to treat of in his poem, especially the prosaic discussion of the quantity of each kind of grain required for sowing an acre. Whatever Vergil has said in regard to the times of sowing different kinds of grain, however, has been entirely verified by Pliny and in the case of sowing of the

eleven grains mentioned by Vergil, his advice is quoted and commented on by the later writer.

As is usually the case with Vergil's poetical digressions, we find nothing in Pliny's work to correspond to the beautiful digression on the five zones and the zodiac of Georgics I 231-251. Pliny does indeed devote considerable space to astronomical points and like Vergil introduces the subject in connection with the question of the proper times for sowing. But his treatment of the subject is purely didactic, dealing with the rising and setting of the stars and the four seasons while Vergil's digression serves little or no purpose in the poem except that of adornment.

After again emphasizing the advantages to farmers and sailors coming from the observation of the stars, 252-258, Vergil next proceeds to suggest work suitable for rainy days and holy days, 259-273. The tasks which he enumerates for rainy days are: the sharpening of the plough-share, making troughs, marking cattle, mumbering grain sacks, sharpening stakes and forks, making willow bands for the vine, weaving baskets, parching and grinding corn. The work which he mentions as lawful for

holy days is: letting off rivers, planting hedges, setting traps for birds, burning brambles, washing sheep and exchanging farm produce. Pliny says nothing about the employments for rainy days but in XVIII, 8, he says that he is a very bad manager who does on a work-day what he might have done on a feast day.

Vergil next briefly treats of the lucky and unlucky days of the month. The fifth he says is unlucky, for it is the birthday of Orcus and the Furies, and the unpropitious Titans; the seventeenth is lucky for planting the vine, breaking young oxen and weaving. The ninth is propitious to runaway slaves, unfavorable to thieves. Pliny in his discussion of the moon and its revolutions, XVIII, 76- says that Vergil has even gone so far, in imitation of Democritus, as to assign certain operations to certain days of the moon but declares that he will himself merely consult general principles. He gives several precepts, however, concerning different operations to be performed at different times of the moon as well as an account of the revolutions of the moon.

But some things can be done better by night than by day, Vergil

says and proceeds to give a list of the occupations, first of the summer night, then of the winter night. Night is the best time, he says, for cutting stubble and dry meadows, as there is always plenty of moisture at night, to make the grass pliant. The long winter nights, he says, may be spent by the farmer in cutting torches, by the farmer's wife in weaving or boiling down must, skimming it with leaves. Pliny in his treatment of the subject of Haymaking XVIII, 67 corroborates Vergil's statement that meadows should be mown at night. He says that some persons turn water upon the hay, the day before mowing, but that it is the best plan to cut hay in the night while the dews are falling. The occupations of the winter evening which Pliny mentions in his discussion of the work to be done at the winter solstice are: the weaving of baskets, hurdles and panniers and the cutting of torches, and stays for the vine. In his discussion of the works of autumn, also XVIII, 74, Pliny mentions the boiling of defrutum and says that it must be done on a night when there is no moon or if it is a full moon, in the daytime. The liquor too, he says, should never be skimmed with anything but a leaf, for

if the vessel is touched with wood, it is thought that the liquor will have a burnt and smoky flavor.

After the work of the night, Vergil discusses the employments of the day both in summer and in winter. In summer, threshing, ploughing and sowing are done. Winter is the time of relaxation from care when the farmer enjoys the fruits of his labor. Yet even in winter there are tasks to be performed - the gathering of acorns, the laurel berry, the olive and the myrtle, snaring and hunting birds and animals.

Pliny XVIII, 63 says that the vine should never be touched at the winter solstice; Hyginus, he says recommends us to strain wine, the seventh day after the winter solstice, if the moon is seven days old; the cherry tree should be planted about this time, acorns put in soak for the oxen, timber cut and stays prepared for the vine.

This subject of the occupations suitable for various days has been treated altogether differently by the two authors. Even the points in which a similarity is manifest are introduced in different

connections, and only at one point the treatment of lucky and unlucky days, is any reference made by Pliny to this whole passage of the Georgics lines 259-310. Although the subject matter is similar in many particulars, the only point where there is any indication that Pliny borrowed his precepts directly from Vergil is the recommendation given by both writers that meadows be mown by night when the grass is wet.

After the question of the distribution of the year's work has been disposed of, Vergil gives a graphic description of the destruction wrought by the sudden storms of spring and autumn and bids the farmer guard against them by careful observation of the stars and propitiatory sacrifices to Ceres.

Pliny XVIII, 69 says that there are two kinds of evils inflicted upon the earth by the heavens and that the first of these is the tempest including hail -

storms hurricanes and other such calamities. These tempests are caused, he says, by certain harmful constellations Arcturus, Orion and the Kids for example. Again in xviii, 5-7 he says that hail-storms and showers come in accordance with the movements of certain stars and that it is for this reason that Vergil has warned us to study the courses of the planets, particularly Saturn. He refers to this passage of the *Georgics*, again just before his treatment of the subject of prognostics and signs of the weather, xviii, 18. "Hoc placuisse Vergilium magno opere video siquidem in ipsa messe saepe concurrere proelia ventorum dammosa imperitiae refert."

Considerable attention is given by both writers to the subject of prognostics and both treat it in much the same way. The prognostics given by Vergil are taken for the most part from *Aratus* those given by *Pliny* were probably drawn partly from the same source, partly also from *Theophrastus*.

Vergil first treats of the signs of wind, — the swelling of the sea, crackling sounds in the mountains, noises on the beach and in the woods, the gulls flying home, the cormorants leaving their natural element for the land, the herons

deserting their swampy haunts and flying through the air, shooting stars, chaff and fallen leaves flying about, and down floating on the surface of the water.

Pliny also gives certain prognostics of wind to be derived from water, including all that Vergil gives and others that he has omitted. He says that if the shores reecho, while the sea is quiet, a violent storm may be expected; or if, when calm, it roars and throws up foam and spray. if sea pulmones are seen floating on the surface also it is an indication of stormy weather. When the sea swells more than when merely ruffled by an ordinary breeze, it is a sign that the winds are already working within it. Again, in chapter 26 he says that the reverberations of the mountains furnish prognostics of the weather; also the quivering of leaves without wind, the floating about of the downy filaments of the thorn or poplar and feathers skimming along the surface of the water. He agrees with Vergil that sea-gulls forsaking the sea is a sign of rain but says that when cormorants make a chattering sound in the morning, it is a sign of stormy weather; according to Vergil it is when the cormorants leave the sea for the land that wind is portended.

His statement in regard to the prognostication given by the heron is contradictory to Vergil's. He says that stormy weather is foretold when the heron stands moping in the middle of the sands; Vergil says that when the heron leaves the sea and flies aloft in the air, wind is foretold.

The signs which foretell rain, according to Vergil are; thunder in the East and West and lightning in the North, cranes descending to the valleys for shelter, cattle snuffing the air, swallows flying low, frogs croaking, ants carrying out their eggs, the rain-bow, crows cawing, and flapping their wings, sea-birds sportively sprinkling each other with water, the raven croaking, the oil sputtering in lamps, and clots forming round the wick.

Pliny ^{XVIII}, 81. gives several prognostics to be derived from thunder and lightning but not the same as those given by Vergil. According to Pliny's statement, when it lightens from the North not rain, as Vergil tells us, but wind may be expected from that quarter. Pliny says that there will be rain when it lightens from the Northeast both rain and wind when it lightens from the South-west or North-west. He corroborates many of the prognostics derived by Vergil from animals

and birds. Oxen, he says, XVIII, 88 when they snuff upwards toward the sky portend impending changes of weather, also ants when they hurry to and fro or are seen carrying out their eggs. He says also XVIII, 87 that it is indicative of stormy weather, when cranes make for the interior, when they fly aloft in silence, fine weather is portended; that jack-daws returning late from feeding are an indication of stormy weather, also land birds going down to the water and besprinkling themselves - especially the crow; also the swallow when it skims along the surface of the water so near as to ripple it occasionally with its wings. Oling gives a number of prognostics from fire, XVIII, 84, from the color and character of the flame and from the burning coals and the cinders.

Among others, he gives the one mentioned by Vergil; "fungi" he says "on the burning wick of the lamp are a sign of rain".

When clear weather is at hand, according to Vergil, the moon and stars are bright. The sky is free from fleecy clouds the kingfishers cease to sun themselves on the shore, the swine to toss in their snouts the loosened bundles of hay; the clouds lower and stretch themselves along the plain; the owl, at sunset, sing her song.

the osprey and the ciris pursue each other in the clear sky; the crows make a chattering noise in their nests.

Pliny, among several other prognostics given by the clouds XVIII, 82 mentions the ones given by Vergil. When clouds, in appearance like fleeces of wool, he says, spread in large numbers from the East, they indicate rain for three days. When clouds settle on the mountain summits, there will be stormy weather but if the clouds clear away, it will be fine. Pliny agrees with Vergil in giving the owl as a prognosticator of fine weather but says that this is the case only when it screeches during a shower. He also says that when swine tear to pieces bundles of hay, it is a sign of a change of weather, that is of an impending storm. When they do not do so, it would signify fine weather, as Vergil says.

Vergil next considers the various prognostications afforded by the moon. His treatment of this subject is very brief and definite. If the horns of the new moon are dull, with dark air between, there will be rain; if the new moon is ruddy it is a sign of wind. If on the fourth day, she is clear, with horn unblunted, both that day and all the remainder of the month will be free from wind and rain.

Pliny treats of this subject at much greater length but corroborates nearly all that Vergil says. If the moon rises clear, he says the weather will be fine, but if she is red there will be wind and if of a swarthy hue, rain. Then follow other signs derived from the new moon, the full moon, and from the different days of the moon, the fourth, fifth and sixteenth, not mentioned by Vergil.

Next come the prognostications derived from the sun. Vergil mentions as signs of rainy weather given by the sun a spotted and cloudy or hollow disk at its rising and a dark, gray sunset. The signs of rain according to Pliny are: a cloudy sunrise, apparent union or contraction of the sun's rays at its rising or setting, a pale sunrise and finally when the sun at its rising throws out its rays afar through the clouds and the middle of its disk is clear.

According to Vergil a South wind is prognosticated by a spotted and cloudy or hollow disc at the rising of the sun; East winds by a ruddy sunset. Pliny tells us that it is indicative of wind if the sun at its rising is hidden in reddish clouds, if clouds

hang over the face of the sun without surrounding it; if at its rising, the sun is surrounded with a circle which breaks at some quarter; - also if the sun is pale - at its setting there will be wind and if there is a dark circle around it, high winds will arise in the quarter in which the circle breaks.

Both wind and rain, Vergil tells us, are presaged by a sunset in which dark grey and fiery red spots are mingled. Pliny mentions many conditions of the sun which portend both wind and rain, - when the sun is hidden by black and red clouds intermingling, when at sunrise, the clouds are dispersed in various quarters; when clouds coming from the south hang over the face of the sun without surrounding it, when the rays of the sun are seen before it rises.

According to both writers a cloudy or pale sunrise indicates hail.

A bright sunrise and sunset, Vergil tells us, is an unfailing sign of fair weather. Pliny makes the same statement but says also that a bright sunrise alone is a sign of fair weather, so also is a ruddy sunset and that if the sun at its rising is surrounded by a circle which

does not break but disappears equally through-out the weather will be fair.

There is less unanimity in the two authors here - in the prognostications - given by the sun than in any other part of the subject. They agree only in the very general statement that a bright clear sunrise indicates fair weather, while a pale or cloudy one presages rain, wind or hail.

In the passage as a whole, however, there are many similarities and only two direct contradictions. Pliny mentions a large number of signs which Vergil has omitted and often differs from him in detail. Of thirty-one signs given by Vergil, however, twenty-two are substantially repeated by Pliny. But the different order and arrangement of precepts in the two authors and the frequency with which different signs are drawn from the same things would seem to indicate rather a common source than the direct borrowing of the one from the other.

With this discussion of prognostics derived from various sources the didactic portion of the first book of the Georgics ends. Then follows,

461-491, an account of the protests which attended the death of Caesar and the book closes with a prayer to the Gods to spare Augustus Caesar that he may aid a world torn by the fury of wars and internal dissensions.

The eighteenth book of Pliny's natural history also closes with the list of prognostics and signs of the weather. His work includes discussions of many subjects which Vergil has not treated especially the methods of harvesting and storing grain, diseases of grain and their remedies, the work to be done in each season, directions about buying land and about the location and proper arrangements of a farm-house. It is not at all strange, however, that he should have deemed it necessary to add these subjects to those which he found treated in Vergil's work. They are all important agricultural questions and are regularly discussed in treatises on agriculture.

On the other hand, from seventeen separate subjects discussed by Vergil, in the first book of his poem, there is only one, the agricultural implements necessary for the farmer, which Pliny has failed to treat. As a rule he gives a much

more detailed treatment of each subject than Vergil does, but he seldom fails to corroborate any important recommendation of Vergil's. Only two statements made by Vergil in the first book are contradicted by Pliny - the two already noticed, relating to the prognostications of storm given by the actions of the heron and by lightning from a certain quarter of the heavens. But these are of very minor importance and do not affect in the least our estimate of Vergil's knowledge of practical agriculture.

Very frequently also, Pliny quotes Vergil as an authority or comments - never unfavorably or recommends - given by him. In the first book of the Georgics and the portion of the second book included in this paper lines 176-225 - seventeen passages are referred to by Pliny in this way.

It is plainly evident from these facts that Pliny looked upon Vergil's work not merely as a beautiful work of art but also as a valuable treatise on agriculture. While it is true that Vergil's literary eminence must have given him great influence over the mind of a student and scholar such as Pliny was, yet such marked

similarities in the two authors can be explained only on the supposition that Pliny regarded Vergil as a thoroughly reliable authority on agricultural practice and his precepts accurate statements of the best agricultural knowledge of his time.

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